

Supplementary Information for:

# Powering electronics by scavenging energy from external metals

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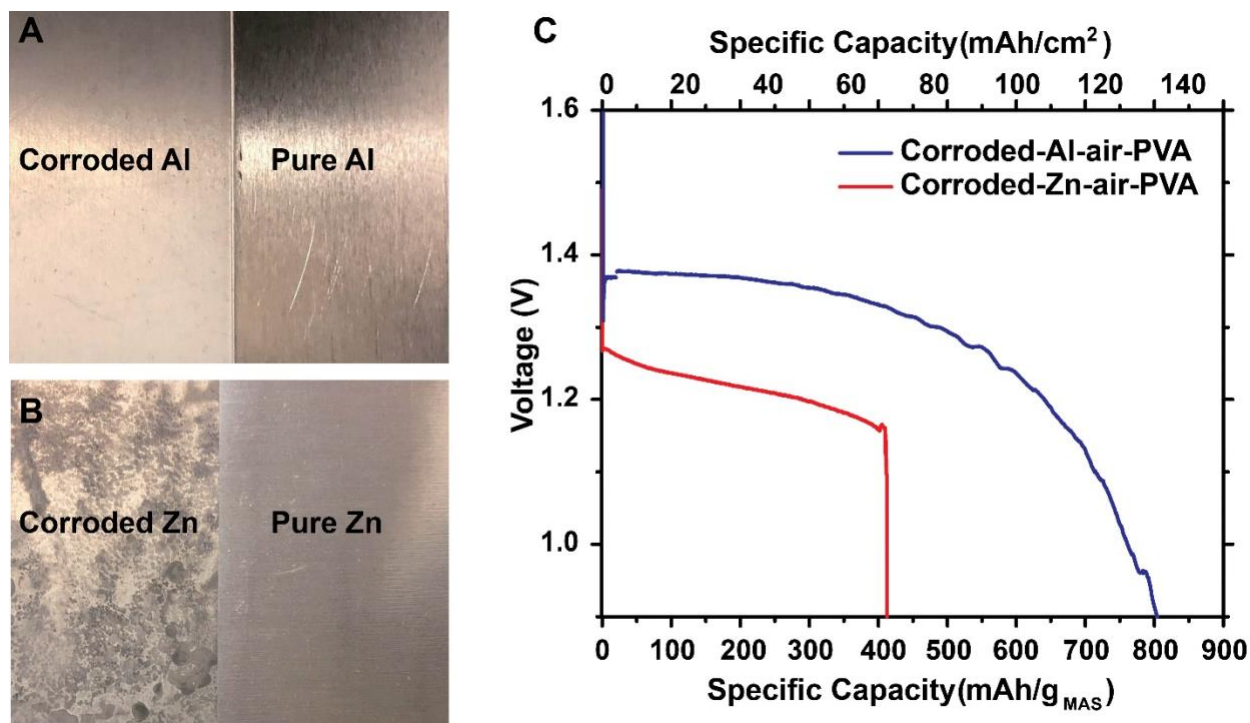
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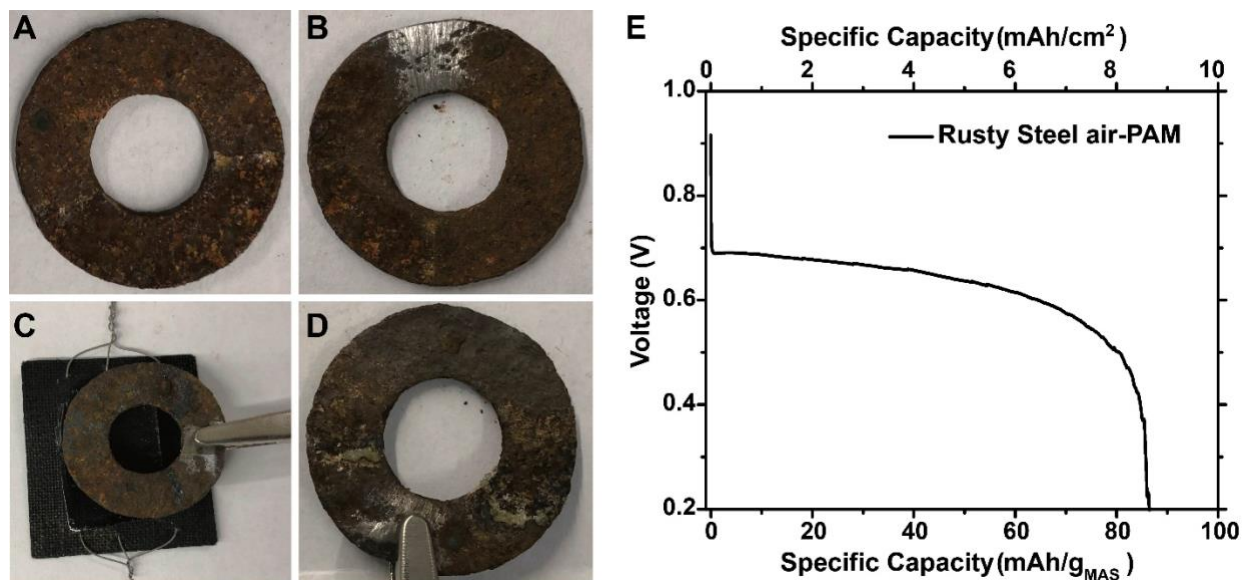
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**Table S1.** Data for the aluminum-MAS in Figure 4D

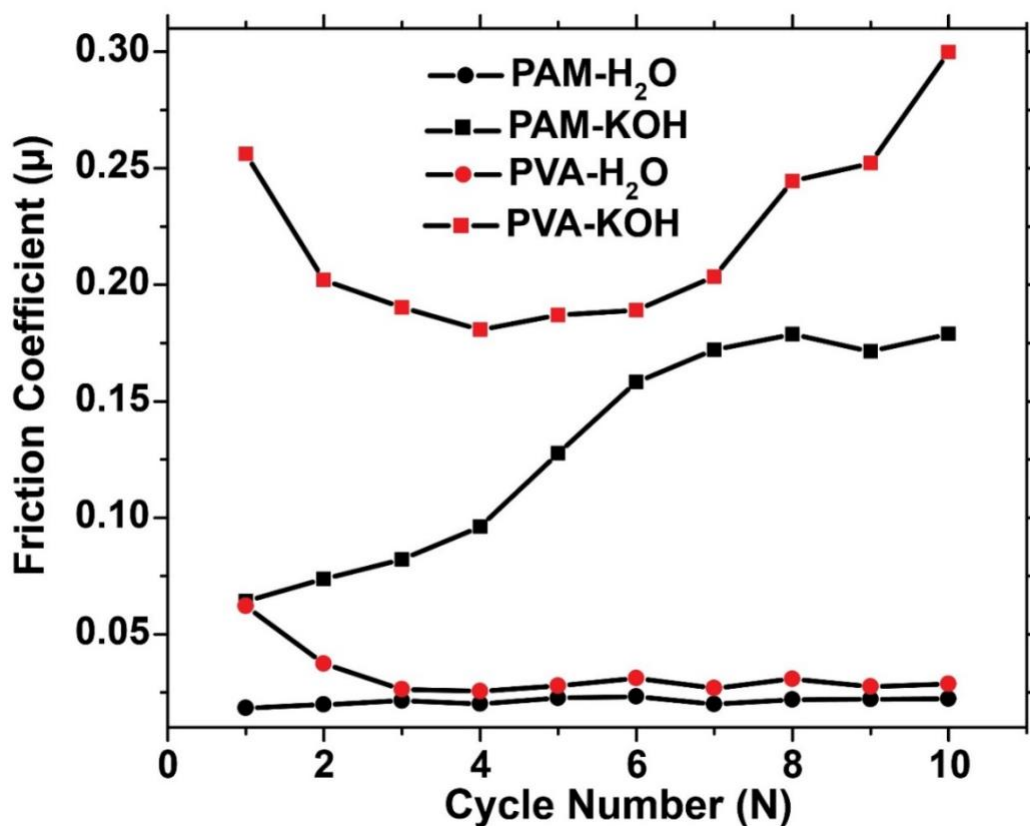
Total Area (Area/A <sub>0</sub> )	Total electrolyte added (grams)	Max energy density (Wh/kg)		Max power density (W/kg)	
		PVA	PAM	PVA	PAM
1	0	1299	1044	217	191
10	8	1800	1472	213	190
20	16	2122	1765	210	188
30	24	2370	2014	207	186
40	32	2570	2227	205	183
50	40	2747	2364	202	180
60	48	2857	2508	196	178
70	56	2960	2632	190	175
80	64	3022	2745	182	172
90	72	3097	2838	177	169



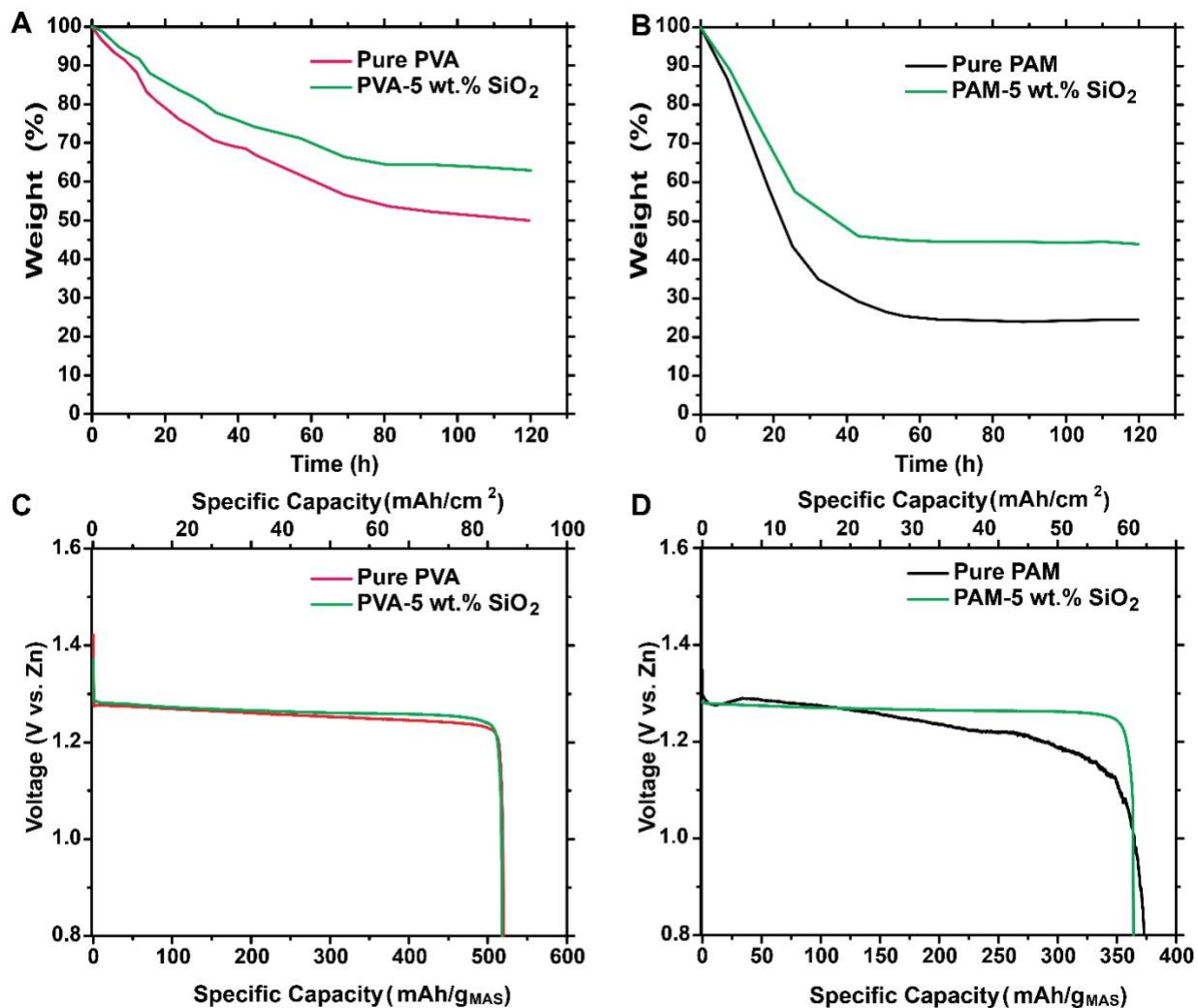
**Figure S1.** Energy extracted from oxidized aluminum and zinc plates. (A) A photograph of oxidized and clean aluminum plates. (B) A photograph of oxidized and clean zinc plates. The aluminum and zinc surfaces were oxidized by spraying them with an alkaline solution and letting them sit for 24 hours, followed by baking at 130 °C for 48 hours with a salt water coating. (C) Output voltage versus specific capacities of a MAS with PVA hydrogel discharged at 5 mA/cm<sup>2</sup> on the oxidized aluminum and zinc plates in (A) and (B).



**Figure S2.** Energy extracted from highly oxidized steel washer. (A) A photograph of the highly oxidized steel washer. (B) The washer after partially polishing to allow for electrical contact. (C) The grounded washer connected to a MAS. (D) The washer after discharging. (E) Output voltage versus specific capacities a MAS with PAM hydrogel discharged at 5 mA/cm<sup>2</sup> on the washer.



**Figure S3.** The friction coefficient between aluminum and PVA-H<sub>2</sub>O, PVA-KOH, PAM-H<sub>2</sub>O, and PAM-KOH hydrogels. The coefficient was measured by rubbing a 3 mm diameter aluminum bearing across the hydrogel surface under a 5 mN load at 0.5 mm/s velocity, and measuring the applied force. Each cycle consists of two 1 mm horizontal strokes, with a 60 second resting period between strokes.



**Figure S4.** The water loss over time for 6M KOH PVA (A) and PAM (B) hydrogels with and without 5 wt.% SiO<sub>2</sub>. The samples were kept at 25 °C and 40% relative humidity. (C) Output voltage versus specific capacities of MAS with 6M PVA and PAM electrolytes (with and without 5 wt.% SiO<sub>2</sub>) discharged on zinc. The discharge current density was 5 mA/cm<sup>2</sup>.